

## **Project Code and Title**

### **B.02.02.02 Vehicle Aggressivity and Fleet Compatibility**

#### **Project Objective**

The objective of the program is to explore the potential for reducing injuries by eliminating incompatibilities, both structural and geometric, between passenger vehicles and their potential collision partners

#### **Background**

Crashworthiness performance of passenger vehicles has traditionally been evaluated on the results of a well-defined laboratory crash test. These tests, by nature, focus on minimizing injury to the occupants in the subject vehicle. Unfortunately, pursuing an optimal crashworthy design without regard to its collision partners can lead to very aggressive vehicles. Design modifications which minimize injuries in one vehicle may accentuate injury levels in the collision partner.

#### **Problem Definition**

The purpose of this program is to investigate the problems of vehicle compatibility in multi-vehicle crashes. The focus of this program is to identify and characterize compatible vehicle designs with the goal that improved vehicle compatibility will result in correspondingly large reductions in crash related injuries. While not a new idea, both NHTSA and international government agencies have renewed efforts to study compatibility as a means of reducing crash-related injuries below the levels achievable by merely equipping the fleet with air bags.

#### **Research Approach**

1. **Problem Definition.** Determine extent of the aggressivity/compatibility problem through examination of the accident data; explore relationship between vehicle design & fleet compatibility through correlation of accident statistics and vehicle design parameters (e.g. hood profile, mass, frontal stiffness) extracted from crash test data or physical measurements.
2. **Global Safety Systems Optimization Model.** Develop large scale systems model to evaluate vehicle crashworthiness based on safety performance of the vehicle when exposed to the entire traffic accident environment, i.e., across the full spectrum of expected collision partners, collision speeds, occupant heights, occupant ages, and occupant injury tolerance levels.

3. **Frontal-Side Impact Compatibility.** Develop a problem definition statement, test conditions, and test devices for crash tests which explore the effectiveness of increasing compatibility in reducing occupant responses for the side impact crash mode.
4. **Compatibility of PNGV Vehicles.** Evaluate the crashworthiness and fleet compatibility of experimental passenger vehicles developed under the Partnership for a New Generation of Vehicles (PNGV). In addition, this task will explore the aggressivity of the new generation of Low Mass, Ultra-stiff Electric Vehicles being developed under ARPA sponsorship in a joint research program with ARPA.
5. **International Harmonization.** Coordinate and communicate the results of the U.S. Aggressivity program with emerging aggressivity research programs in the international safety community. In particular, investigate the feasibility of the European proposal to mandate front-end stiffness as a means of regulating fleet compatibility.
6. **Geometric Compatibility.** Examine extent, consequences of geometric incompatibilities, e.g. door sill height and bumper height, and (2) guard rail and vehicle frontal profile.

### Potential Impact/Application

Increased crash compatibility may result in improved safety for major accident modes, with greater improvement for smaller vehicles.

### Key Milestones

#### ► Problem Definition Phase:

- Aggressivity Fleet Ranking
- Vehicle Design vs. Aggressivity Metric: Design Study

RESOURCE REQUIREMENTS	FY95	FY96	FY97	FY98	FY99
Contract Money (\$K)	200	200	800	800	800

**Project Manager(s)**

Clay Gabler

**Completion Date**

TBD, contingent upon findings of Problem Definition Phase

**Publications**

1. Hollowell, W.T. and Gabler, H.C., "NHTSA's Vehicle Aggressivity and Compatibility Research Program." Proceedings of the 15th International Technical Conference on the Enhanced Safety of Vehicles, Paper No. 96-S4-O-01. Melbourne, Australia, May 1996.
2. Gabler, H.C., Hollowell, W.T. and Hitchcock, R.J. "Systems Optimization of Vehicle Crashworthiness." Proceedings of the 14th International Technical Conference on the Enhanced Safety of Vehicles, Paper No. 94-S4-O-12. Munich, Germany, 1994.

**Keywords:** Crashworthiness, aggressivity, compatibility

**Project Tasks**

<u>Task</u>	<u>Title and Description</u>
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Task 1	Problem Definition
Task 2	Global Safety Systems Optimization Model
Task 3	Front-side Impact Compatibility
Task 4	Compatibility of PNGV Vehicles
Task 5	International Harmonization
Task 6	Geometric Compatibility

<b>Task</b>	<b>Start Date</b>	<b>Projected Completion Date</b>	<b>Status/Responsibility</b>
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1	6/95	12/96	NRD-11, VNTSC, UMTRI
2	6/95	ongoing	NRD-11
3	10/95	9/98	VRTC

4	10/96	9/99	NRD-11
5	ongoing		NRD-11
6	10/97	9/99	NRD-11

### Supporting Contracts

<b>Task</b>	<b>Contract Number</b>	<b>COTR (phone)</b>	<b>Contracting Officer (phone)</b>	<b>Total Contract Cost (\$K)</b>
1	DTRS-57-93-C-00173	John Guglielmi, (617)494-2575	Anthony Flaherty, (617)494-2673	\$99,947